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ABSTRACT

This investigation used data from the 28-year-old New York Longitudinal Study to examine the relationship between various negative emotional and behavioral characteristics (e.g., aggression, anxiety, undercompliance, depressive mood) and adjustment. A total of 133 white, middle-class children were rated on these negative characteristics from infancy to adolescence. Measures of family, peer, and personal adjustment were also obtained. Because of the longitudinal nature of the data, it was possible to use structural equation models to address the following questions: (1) are these negative behaviors stable from early life through adolescence? (2) do these emotional characteristics relate to adjustment in childhood and adolescence? and (3) do these emotional characteristics differentially predict multiple adjustment dimensions in adolescence? Two factors of negative emotional behavior, marked by aggression and anxiety, were identified in early and late childhood, and were found to have relatively high stability of individual differences. A differential pattern of prediction for adjustment was also found: aggression predicted maladjustment in family and school settings, whereas anxiety predicted maladjustment in peer relations. Moreover, emotional problems before age seven provided better prediction of adolescent adjustment problems than did either later emotional problems or childhood adjustment ratings. (Author/RH)

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A Structural Equations Analysis of Negative Emotional/ Behavioral States and Adjustment

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Paper presented at the Biennial meeting of the Society for Research in Child Development. Toronto, Canada, April 25-28, 1985.

Abstract

This investigation used data from the 28-year-old New York Longitudinal Study to examine the relationship between various negative emotional and behavioral characteristics (e.g., aggression, anxiety, undercompliance, depressive mood) and adjustment. One hundred thirty-three white, middle-class children were rated on these negative characteristics from infancy to adolescence. Measures of family, peer, and personal adjustment were also obtained. Because of the longitudinal nature of the data, we were able to use structural equation models to address the following questions: (1) are these negative behaviors stable from early life through adolescence? (2) do these emotional characteristics relate to adjustment in childhood and adolescence? and (3) do these emotional characteristics differentially predict multiple adjustment dimensions in adolescence? Two factors of negative emotional behavior, marked by aggression and anxiety, respectively, were identified in early and late childhood, and were found to have relatively high stability of individual differences. A differential pattern of prediction for adjustment was also found: Aggression predicted maladjustment in family and school settings, whereas anxiety predicted maladjustment in peer relations. Moreover, emotional problems before age seven provided better prediction of adolescent adjustment problems than did either later emotional problems or childhood adjustment ratings.

A Long-Term Longitudinal Study of Negative Emotional/Behavioral States and Adjustment

Socioemotional development is an area of increasing concern among psychologists, especially for those working in the domain of personality development (Kegan, Noam, & Rogers, 1982). Personality theorists with a psychosocial orientation have long stressed the interplay between the individual and his or her social context and have placed an emphasis on the bidirectional relationship between emotional development and the adaptational capacities of the individual (e.g., Erikson, 1950; Vaillant, 1978). Since this bidirectional relationship is one that exists throughout the life-span, it is important to assess the relationship between emotional and behavioral characteristics and both concurrent and later life adjustment. However, little empirical work has followed people over a sufficient length of time to assess how particular negative emotional and behavioral characteristics in childhood relate to later life outcomes.

A key concern of many researchers and clinicians is to assess the impact of emotional and behavioral characteristics on psychosocial functioning. The presence of characteristics such as anxiety, aggression, undercompliance, poor peer relationships and depressive moods in children are often associated with poor functioning in other areas, and, in some cases predict problems in later life (Shaeffer & Millman, 1981). For example, it has been found that early aggressive behavior often leads to a negative

socialization cycle that predicts serious adult adjustment problems such as academic failure, delinquency and poor interpersonal relationships (Asher, Oden, & Gottman, 1976; Foster & Ritchey, 1979; Gottman, Ganso, & Rasmussen, 1975; Robbins, 1972; Huesmann, Eron, Lefkowitz, & Walder, 1984). Problems in peer relationships (e.g., peer rejection) have been shown to predict school dropout (Ullmann, 1952), delinquency (Roff, Sells, & Golden, 1972), and psychiatric referrals up to 13 years later (Cowen, Pederson, Babigian, Izzo, & Trost, 1973). Rolf and Hasazi (1977) note that low levels of social interaction in children are considered to be significant indicators of risk and vulnerability.

In addition to the concern regarding the predictive utility of various negative emotional and behavioral characteristics, issues have arisen regarding the continuity and stability of these characteristics. As defined by Kagan (1980), continuity refers to qualitative invariance of an attribute (i.e., aggression would show continuity if its underlying psychological mechanisms are constant over time). Stability refers to the consistency of individual differences in the underlying attribute (i.e., do individuals maintain the same relative differences in the degree of aggression over time). Critical questions, then, are: do these negative emotional and behavioral states show continuity from early to later life? Do these characteristics remain stable? Are there differences in the continuity and stability of these particular states compared to general indices of psychosocial functioning?

Kagan and Moss (1962) found varying degrees of stability in personality characteristics in their Fels study of personality development from birth to adulthood. For example, passive-dependent behaviors were stable for women but not men from middle childhood to adulthood and seemed to be tied to cultural expectations for independence in males and females. Aggression toward mothers was moderately stable from preschool to adolescence and physical aggression to peers was highly stable over the first ten years. However, differences in aggression were far less stable for females than for males (Kagan & Moss, 1962). In addition, achievement behaviors were stable during the childhood years, with achievement at age 10 a good predictor of adult achievement behaviors. In a 22 year longitudinal study of the stability of aggression, Huesmann et al. (1984) concluded that aggression can be viewed as a persistent trait (high continuity) that also possesses cross-situational constancy.

The issue of the continuity of personality and behavioral characteristics is also one that has been the focus of much controversy. Kagan (1980) argues that in certain areas there may be little continuity between early and later development, and the experiences that occur between infancy and adolescence can alter the early dispositions of many children. Moss and Susman (1980) argue that the changing psychosocial demands of each developmental stage alter even the definition of personality variables. Thus, the characteristic of aggression may take the form of physical fighting in preschool, verbal insults in school-aged children,

social rejection in the teenage years, and ruthlessness in business dealings in adulthood. Any analysis of negative emotional behaviors over time must therefore attend to the continuity of the underlying attributes (constructs) without necessarily requiring that the observable manifestations of the attribute be unchanging across the developmental cycle.

The longitudinal nature of the present data set allowed us to explore the following issues: (1) are these various negative emotional and behavioral characteristics continuous and stable from early life through adolescence?; (2) do these characteristics relate to childhood and adolescent adjustment?; and (3) do these negative emotional and behavioral characteristics differentially predict multiple dimensions of adolescent adjustment?

Method

Sample

The subjects for this study were the sample of the New York Longitudinal Study (NYLS). The NYLS was initiated in 1956 by Alexander Thomas and Stella Chess, and is still continuing at this time. The primary sample is composed of 133 people (66 males, 67 females).

The families of this core sample are of middle- to upper-middle class backgrounds and are 78% Jewish, 7% Catholic and 15% Protestant, with 47% of the mothers and 60% of the fathers having both college educations and postgraduate degrees. Furthermore, most of the fathers in this sample are professionals or businessmen with prestigious occupations, and those mothers who

are employed are also involved in highly prestigious occupations (e.g., medical doctors, university professors).

Procedure for Data Collection

The characteristics of this sample and the methods used throughout the study are detailed in several other writings (e.g., Chess & Thomas, 1984; Thomas et al., 1963; Thomas, Chess, & Birch, 1968; Thomas & Chess, 1977, 1980).

Beginning in the first month of the child's life the parents were interviewed periodically (about every three months) for the first few years after which they were interviewed at least once a year until elementary school. As the child entered nursery or elementary school, teachers were interviewed regarding school behaviors. The interviews concerned the child's behaviors and functioning in several content areas (e.g., sleeping, eating, social behaviors, school problems, peer relationships, etc.).

In adolescence and early adulthood, the subjects and their parents were interviewed about various aspects of the subject's functioning (e.g., family relationships, school, social, and sexual functioning, goal implementation, coping patterns, task and person orientation). The specific variables with their descriptions and rating scales are presented below.

Measures

Negative Emotional Behavioral States (NEBS)

Negative emotional/behavioral states (NEBS) were coded by a psychiatrist on the basis of an inductive content analysis of all

of the existing parental, teacher, and clinical interviews from birth until age twelve which contained detailed descriptions of each child's behavior. We should note that clinical interviews were obtained only for subjects who were referred for clinical psychiatric evaluations during the course of their participation in the study. The psychiatrist who made these ratings was not part of the NYLS research group, and she had no knowledge of any other information which existed on the subjects. The degree of anxiety, aggression, dissatisfaction, undercompliance and difficulty with peers were rated for each child for the years one through six. Additionally, the degree of anxiety, aggression, depressive mood, disobedience, and academic difficulties were rated for each subject for the years seven through twelve.

Anxiety (years 1-6 and 7-12). Excessive anxiety was determined on the basis of reports indicating that the child is easily frightened, tense, self doubting, in need of an inordinate amount of reassurance, worried about his or her standing in the family, and performance on tasks. While a good percentage of children have various symptoms traditionally associated with anxiety such as nightmares, fears of animals, difficulty in separating from parents, these were not used as the basis for determination of sustained anxiety state.

Aggression (years 1-6 and 7-12). Aggression was identified if reports of the child's behavior indicated excessive, sustained use of aggressive and destructive strategies in their interpersonal interactions. At times this included physical confrontation, but

more often, particularly in middle childhood the child was hostile, rejecting, and belittling of his or her parents, sibs, teachers and peers.

Dissatisfaction (years 1-6). Dissatisfaction-unhappiness was identified if the child was repeatedly described as hard to please, always dissatisfied, unhappy with his or her own performance, social standing, or place within the family.

Undercompliance (years 1-6). Undercompliance was considered to be present if parents reported behavior such as failure to obey or listen.

Difficulty with peers (years 1-6). This was considered to be present as a state when parents reported difficulty in getting along with other children.

Depressive mood (years 7-12). The following description of "depression" was taken from the DSM-III and served as the criteria for coding the presence of depressive mood.

Mood of child may be described as depressed, sad, hopeless, discouraged, etc. Children display persistently sad facial expression. Other indicators include: a) loss of interest or pleasure in all or almost all usual activities; b) withdrawal from family or friends; c) appetite disturbance; d) sleep disturbance; e) decreased energy level; f) feelings of worthlessness or guilt; g) difficulty concentrating; h) thoughts of death or suicide.

Disobedience (years 7-12). This was coded from parental reports of disobedient behavior at home. It is similar to undercompliance for years 1-6.

Academic difficulties (years 7-12). Any difficulties in school pertaining to academics were coded from both school reports or parents reporting about school.

For a negative emotional/behavioral state to be considered present, even at a mild level, the parent had to mention it in two consecutive interviews over a time period of no less than six months; or both a parent and a teacher had to mention it. This was to avoid using day to day mood fluctuations as a basis for inferring a sustained emotional state. Scores for each rating of a negative emotional/behavioral state range from 0 (not present) to 3 (severe). A reliability check was conducted using 20 subject files randomly selected from the overall sample. Two trained raters (Raters B and C) read through all of the pertinent file material and made ratings based on the same criteria from which the original ratings were made. They then each rated 10 subjects and interrater reliabilities were estimated between the original rater (Rater A) and Raters B and C. To estimate these reliabilities, we applies the logic of intraclass correlations (see Shrout & Fleiss, 1979). The rater data were analyzed in a (Rater X Targets X Subjects) repeated measures ANOVA, and estimates of the relevant variance components were calculated under the assumption of a random effects model using computational formulae provided by Dodd and Schultz (1973). Using this method, we determined that Raters A and B achieved a .91 coefficient of agreement on the NEBS, while Raters A and C had a .83 level of agreement.

Three- and Five-Year Home Adjustment

In order to obtain home adjustment ratings for each subject, the three- and five-year parental interviews were coded for problems in the following areas of functioning: Sleep, eating, elimination, sex, fears, speech, motor, relationship with parents, discipline, relationships with siblings, relationships outside the family, coping, and parental attitudes toward the child (e.g., expression of dislike for the child, inconsistency in handling). Raters read through all pertinent interview material and made an assessment of each area. Scores ranged from 1 = insignificant to 5 = severe. Interrater reliabilities (intraclass correlations) of these ratings ranged from .34 to .98.

Adolescent Adjustment

To obtain adolescent adjustment ratings in various areas of functioning for each subject, the adolescent interviews with the subjects and parents were rated on a 7-point scale, with 1 = poor adjustment to 7 = excellent adjustment, for each of the following categories: self-evaluation, family relationships, school functioning, social functioning, sexual functioning, goals, implementation of goals, coping patterns, person orientation, task orientation, routines, communication, and emotional expressiveness. A trained rater selected 20 subject files from the overall sample and read all pertinent file material and made ratings based on the same criteria from which the original ratings were made. Using the same Rater X Targets X Subjects repeated measures ANOVA described

above, the two raters achieved a .93 coefficient of agreement on the adolescent adjustment ratings.

Statistical Procedure

Our approach to the analysis of relationships between emotional behaviors and levels of adjustment uses structural equation modeling techniques. Structural equation models involve estimation of systems of regression equations in which the variables in the regression system are "latent" variables defined by a multiple indicator measurement model (see Heise, 1975; Kenny, 1979). Structural regression models are ideal for analyzing regression models for longitudinal data, since the method permits estimation of structural relationships while removing the attenuating influences of measurement error on the regression coefficients (e.g., Dwyer, 1983; Jöreskog & Sörbom, 1977; Rogosa, 1979). The structural equation approach also permits special multiple indicator models that allow specification of correlated residual components among longitudinally measured variables which might otherwise contaminate the estimated regression coefficients (e.g., Sörbom, 1975).

We used the LISREL VI program (Jöreskog & Sörbom, 1984) to estimate the statistical models described in this paper. This version of LISREL contains many useful features for exploratory model building of the type we describe below. All models were estimated only by using the "y-side" of LISREL's full model, primarily because modeling all latent variables as endogenous variables facilitated evaluation of the fit of the model to all

covariances among observed variables. LISREL's model includes (1) a measurement model, describing the relationship of observed variables to latent variables; and (2) a structural model, representing the system of regression equations involving the latent variables. Formally, LISREL's measurement model may be represented by the matrix equation

$$\underset{\sim}{y} = \underset{\sim}{\Lambda}\,\underset{\sim}{\eta} + \underset{\sim}{\varepsilon} \qquad (1)$$

in which a vector of observed variables, $\underset{\sim}{y}$, is specified in terms of their regression on a vector of latent variables, $\underset{\sim}{\eta}$, with regression residuals $\underset{\sim}{\varepsilon}$. The p x m matrix, $\underset{\sim}{\Lambda}$, contains the regression coefficients of observed variables on latent variables. Equation (1) implies that the covariance matrix of the observed variables in the population, $\underset{\sim}{\Sigma}$, may be expressed as

$$\underset{\sim}{\Sigma} = \underset{\sim}{\Lambda}\,\underset{\sim}{C}\,\underset{\sim}{\Lambda}' + \underset{\sim}{\Theta} \qquad (2)$$

where $\underset{\sim}{\Lambda}$ is as before, $\underset{\sim}{C}$ is the covariance matrix of $\underset{\sim}{\eta}$, and $\underset{\sim}{\Theta}$ is the covariance matrix of $\underset{\sim}{\varepsilon}$. Equation (2) is in essence a restricted factor analysis model factoring the observed variables in $\underset{\sim}{y}$ to obtain the latent variables (see Jöreskog & Sörbom, 1979).

LISREL's structural model represents the regression relationships among these latent variables, $\underset{\sim}{\eta}$, as follows:

$$\underset{\sim}{\eta} = \underset{\sim}{B}\,\underset{\sim}{\eta} + \underset{\sim}{\zeta} \qquad (3)$$

where $\underset{\sim}{B}$ is an m x m matrix of regression coefficients regressing each latent variable on other latent variables (the regression of a

variable on itself, the diagonal elements of $\underset{\sim}{B}$, are fixed to 0 in this representation). In practice, many of the elements of $\underset{\sim}{B}$ will be hypothesized to be 0 due to model assumptions. Under certain assumptions, especially the assumption that all relevant causal influences in a system have been directly represented in the model (see James, Mulaik, & Brett, 1982), these structural regression coefficients may be treated as estimates of the magnitude of functional causal relations among the latent variables.

The structural model in Equation (3) implies that $\underset{\sim}{C}$, the covariance matrix of the latent variables, may be represented as

$$\underset{\sim}{C} = \underset{\sim}{B}^{-1}\,\underset{\sim}{\Psi}\,\underset{\sim}{B}^{-1\prime} + \underset{\sim}{\Psi} \qquad (4)$$

where $\underset{\sim}{B}$ is as before and $\underset{\sim}{\Psi}$ is a residual covariance matrix representing variance and covariance among latent variables NOT accounted for by the regression coefficients. When modeling regressions only on LISREL's y-side, it is necessary to model covariances among exogenous variables as covariances in interpretation of residual variance in regression models.

The parameters in the $\underset{\sim}{\Lambda}$, $\underset{\sim}{\Theta}$, $\underset{\sim}{B}$, and $\underset{\sim}{\Psi}$ matrices are estimated by LISREL's maximum likelihood method, provided that a unique solution for the parameters has been identified by placing a sufficient number of restrictions on the equations to identify the remaining unknowns. Restrictions are placed by either (a) fixing parameters to known values a priori; or (b) constraining a set of two or more unknown parameters to be equal in value. In the models we consider, restrictions were only placed by fixing parameters.

For example, we identified structural regression models by requiring that certain regression coefficients be fixed equal to zero. Longitudinal data are particularly amenable to structural regression since it is possible to rule out (a priori) time-reversed directions of causation (e.g., it is impossible for adolescent adjustment to cause emotional behaviors at age six given the logical necessity that a cause precede an effect in time).

Overidentified models (models which have more fixed parameters than are necessary to achieve identification) place restrictions on the hypothesized form of the population covariance matrix. These overidentifying restrictions may be used to test the fit of the model to sample data using a likelihood ratio χ^2 statistic. LISREL also provides other useful indices of model fit less dependent upon sample size than may be used to test the null hypotnesis that the restrictions are true in the population. The statistic provides the basis for falsifying a restricted model in favor of a less restricted model if relaxing the restrictions significantly improves the fit to the sample data. Although the validity of this approach depends upon certain statistical assumptions about the population distributions (so that the tests should be evaluated with care, see Long, 1983), the advantage is that alternative structural regression models may be compared and, perhaps, falsified on the basis of sample data. This approach plays an important role in our evaluation of alternative models described below.

The structural models described in this paper were estimated using unstandardized, covariance metric solutions--an approach that is required for valid analysis of longitudinal data (see Jöreskog & Sörbom, 1977; Rogosa, 1979). Since standardized regression coefficients are generally easier to interpret, we report parameter estimates which have been rescaled to a standardized metric. Although LISREL provides a "standardized solution," this rescaling option standardizes only the latent variables (and hence, the parameters escimates for B and Ψ). Standardized estimates for the measurement model parameters in Λ were obtained by use of a SAS PROC MATRIX program written by the second author.

Several of the observed variables analyzed in the current study are multiple level ordinal rating scales (e.g., the emotional behavior variables). LISREL assumes that all variables are continuous and are distributed multivariate normal in the population. Violation of this assumption requires care in analytic interpretation of goodness of fit tests; recent work by Huba and Harlow (in press) suggests that LISREL estimates are valid in such applications, but that standard errors and χ^2 fit tests are often inflated. Thus the use of these ordinal rating measures does not contraindicate use of LISREL to analyze the data, but it probably causes spuriously bad χ^2 indices of fit.

Results

Initial Analysis

The structural regression analysis proceeded as follows: a) first, a multiple indicator latent variable model was developed for

each of the subdomains of observed variables (emotional/behavioral states, three year adjustment, five year adjustment, and adolescent adjustment) using exploratory factor analysis; b) these models were then combined to form an overall measurement model for all observed variables which was estimated (and modified) by using LISREL VI; and c) after a final measurement model was developed, a set of alternative structural regression models were estimated and compared latent variables. This procedure is unabashedly exploratory in nature, and hence the outcomes may be to some degree sample data dependent. Our results should therefore be interpreted as one would interpret any exploratory multivariate analysis; in particular, we do not claim that an a priori causal model has been "confirmed" by use of LISREL. Nevertheless, the hypothesis-testing capabilities of LISREL were useful in evaluating the relative consistency of alternative structural models to the data.

We shall not report the intermediate results from the exploratory factor analyses comprising step a) of our procedure, since these results are reflected in the final measurement model resulting from step b). Briefly, these exploratory analyses were used to identify measures of emotional behavior and adjustment that indeed did factor to form latent variables. Those indicators that were optimal markers of the latent variables identified by the analysis were then included in the overall measurement model of step b. In addition to variables measuring these latent variables, certain adjustment variables which did not form latent variables at age three were found to have relatively high correlations with

emotional/behavioral characteristics; these adjustment variables were also included in the overall LISREL analysis.

The latent variables identified on the basis of the exploratory factor analysis are as follows. At both the 1-6 and 7-12 year intervals, two negative emotional/behavioral factors were identified--Anxiety and Aggression. We have labeled them Anxiety 1 and 2 (ANX1, ANX2) and Aggression 1 and 2 (AGG1, AGG2). We should note here that we are using Anxiety and Aggression merely as labels for these two negative emotional/behavioral factors, but they represent a range of behaviors. Anxiety and Aggression were chosen as labels because these subcategories had the highest loadings on these factors. However, the Anxiety 1 factor is comprised of anxiety 1-6, dissatisfaction 1-6, and peer difficulties 1-6. The Anxiety 2 factor is comprised of anxiety 7-12 and depression 7-12; the Aggression 1 factor is comprised of aggression 1-6 and noncompliance 1-6; and the Aggression 2 factor is comprised of aggression 7-12, disobedience 7-12, and school difficulties 7-12.

Three-year adjustment was characterized by a general adjustment factor and two specific adjustment problems, eating and fears. The general adjustment factor loaded most heavily on Parenting, Attitude, and Discipline (labeled PAR1). Adjustment at age five was characterized by two separate adjustment factors--a general adjustment factor and adjustment problems specific to motor and speech problems (labeled MOT2). Again, the general adjustment factor related most closely to the area of Parenting, Attitude, and Discipline (labeled PAR2). Adolescent adjustment was characterized

by three separate factors: Family adjustment (labeled FAM), Social/Peer adjustment (labeled SOC), and School adjustment (labeled GOAL).

Development of the Measurement Model

At this point a series of LISREL factor analysis models for the simultaneous factor analysis of all variables were estimated. This analysis was based upon the covariance matrix of 75 cases having complete data on all variables selected. These alternative models primarily consisted of successive modifications of the model to improve statistical fit, usually by adding residual covariances between specific indicators. This final measurement model had a χ^2 of 581.49 (df = 434, $p < .001$) indicating that the model did not perfectly account for the covariances among the observed indicators. This was also reflected in the LISREL goodness of fit index of .72. Nevertheless, none of the remaining modifications that could be considered as theoretically defensible would have resulted in statistically meaningful improvements in fit (as judged by LISREL's modification indices). Moreover, the parameter estimates were basically invariant across a number of alternative models tested. Given that some lack of fit is to be expected given the ordinal rating scale nature of several of the items (see Huba & Harlow, in press), it was concluded that the final measurement model was a stable and useful representation of the underlying factor structure of the observed variables.

Table 1 provides the standardized factor pattern matrix (Λ) and Table 2 gives the factor correlation matrix from the final

model. All factor loadings estimated in Λ were saliently nonzero, being greater than twice their standard error. Perhaps the most interesting results involve the correlations among the factors. Anxiety and Aggression were moderately correlated in both age intervals, but clearly represent distinct dimensions of negative emotional behaviors. Individual differences in both Anxiety and Aggression were relatively stable across these two time periods; Anxiety 1 and Anxiety 2 correlated about .7, whereas Aggression 1 and Aggression 2 had a roughly .8 correlation over time. In terms of emotion/adjustment correlations, differential patterns emerged for Anxiety and Aggression. At three and five years of age, adjustment problems were more highly correlated with Aggression than with Anxiety, with higher correlations associated with "early" emotional behavior problems (Aggression 1). However, there was a specific relationship between eating and fear problems at age three to Anxiety 1. In addition, of the two adjustment variables emerging at age five (PAR2, MOT2) PAR2 is more highly correlated with the NEBS ratings. However, the MOT2 has a specific prediction of school difficulties at ages 7-12 which is independent of the relationship between MOT2 and AGG2.[1]

A differential pattern of correlation emerged between emotional behaviors and adolescent adjustment problems. Social/Peer Adjustment problems correlated slightly higher with Anxiety than Aggression, but the reverse was true for Goal-related and Family adjustment (i.e., higher correlations with Aggression). There was also a trend for adjustment to correlate more highly with

negative emotional behaviors during the 1-6 age range than with emotional behaviors in the 7-12 age range, even for adolescent adjustment.

Insert Tables 1 and 2 about here

Structural Regression Models

The purpose of the structural regression analysis was to attempt to represent this correlational structure among the latent variables in terms of a regression model. The top panel of Figure 1 depicts a simplified, theoretically plausible representation of the relations among the latent variables, assuming for the moment that there is just one latent variable measuring emotional behaviors and adjustment at each age level. In this model, negative emotional/ behavioral states (NEBS) are stable (to some degree) over time, such that children with emotional/behavioral problems during the 1-6 age range are relatively likely to have similar problems in the 7-12 age range. The model suggests that emotional/behavioral problems during ages 1-6 predict adjustment problems at age three, and that there is some stability in adjustment problems between ages three and five. Finally, the model posits prediction of adolescent adjustment problems by adjustment at age five. This model may be understood as a mediated model of emotional behavior/adjustment relationships, such that the relationship between emotional behavior and adolescent adjustment

is mediated only through adjustment at earlier ages (i.e., ages three and five).

It is instructive to consider an alternative model depicted in the center of Figure 1, which posits a direct influence of emotional behaviors during ages 7-12 on adolescent adjustment. This influence is independent of the indirect effect of childhood emotional behaviors on adolescent adjustment mediated through childhood adjustment. This model is perhaps the most plausible on an a priori basis, since it posits that there are shifts in individual differences in negative emotional/behavioral states and adjustment problems between childhood and adolescence. The two constructs are related at both periods of development, but there is an emergent aspect of the emotion/adjustment relationship that is not predictable from childhood emotion or adjustment per se. Simply put, adjustment problems are specific to the age period in question. Given that the adolescent adjustment factors differentiate into Goal-Oriented, Family, and Social/Peer adjustment problems, a higher relationship of later emotional behaviors to adolescent adjustment problems is certainly plausible, if not indeed the expected pattern of relationships.

Insert Figure 1 about here

Note, however, that this model is not fully consistent with the magnitudes of the correlations presented in Table 2 among the latent variables. To reiterate, adolescent adjustment factors

exhibited higher correlations with negative emotional behaviors during the age 1-6 period. These correlations suggest an alternative model that served as the starting point for our structural regression analysis, as shown in the bottom panel of Figure 1. It posits a direct effect of childhood emotional behaviors on adolescent adjustment independent of the indirect effects mediated through childhood adjustment. Thus, part of our structural regression analysis was designed to determine whether this pattern of correlations in the measurement model could be considered a chance phenomenon consistent with the mediation or period-specific prediction models.

We began by specifying a model inspired by the logic of Figure 1, with the additional constraint that there be differentiation of the prediction of adolescent adjustment by Anxiety and Aggression. As suggested by the correlations in the measurement model, we structured the direct effects as Anxiety on Social/Peer adjustment and Aggression on Family adjustment. Since the model also included influences of age five adjustment on the adolescent adjustment variables, these direct effects for Anxiety and Aggression were forced to provide prediction of adolescent adjustment independent of the mediated effects of Anxiety and Aggression on the three adolescent adjustment factors via adjustment at age five.

This initial model fit the latent covariances from the measurement model relatively well. This conclusion is based upon the evaluation of the loss of fit produced by adding the structural regression specification onto the final measurement model. In

Bentler and Bonett's (1980) terms, the measurement model is a saturated model with respect to the latent variables, because it specifies an unstructured covariance matrix among latent variables. A perfectly fitting structural model could thus have as an asymptotic fit the χ^2 of the final measurement model. Conversely, to the extent that the structural model specified does not fit the covariance matrix of the latent variables, then the χ^2 for the model with structural regression will have a significantly worse fit to the data.

The difference in χ^2 from the model with structural regression to the final measurement model was not statistically reliable (χ^2 = 36.57, $\underline{df}$ = 31, $p > .10$). This result indicated that the model with direct influences of emotional behaviors to adolescent adjustment was consistent with the covariance structure of the latent variables. We did identify, on the basis of the modification indices, two additional structural regressions which could be added to the model to improve its fit: the effect of Anxiety 1 on Age 5 Adjustment, and the effect of Aggression 1 on Anxiety 2. These modifications improved the fit further, leaving the χ^2 differences from the measurement model approximately equal to its $\underline{df}$ (χ^2 = 27.07, $\underline{df}$ = 29, N.S.).

To our surprise, however, we discovered that this model contained no significant effects of either of the two five-year adjustment variables on adolescent adjustment! Indeed, an alternative model fixing these regression coefficients to zero did not fit worse than the prior model and was still not significantly

different from the final measurement model (χ^2 = 27.96, df = 32, p > .10). We also identified an additional path (the effect of Age 3 adjustment on Motor adjustment at Age 5) which was not significantly different from its standard error. This parameter was fixed to zero, and the model re-estimated.

The fit of this final model to the latent covariances, as shown in Table 3, was excellent (χ^2 = 28.39, df = 33, p > .10). A graphical representation of the final model is given in Figure 2, which gives the standardized regression coefficients.[2]

Insert Table 3 about here

Insert Figure 2 about here

The results of the analysis were somewhat counterintuitive, given that early childhood emotional behaviors were found to be significant predictors of two types of adolescent adjustment, whereas childhood adjustment and later emotional behaviors were found to have no additional relationships. It therefore seemed prudent to evaluate the alternative models depicted in Figure 1. If it were possible to obtain an adequate fit to latent covariances with either of these other models, then the need for direct effects of childhood emotional behaviors on adolescence would be called into question. Conversely, if these models did not fit the data,

then they could be considered to have been falsified by the data, leaving the direct effects model as a more plausible alternative.

Our first falsification model fixed the direct effects of Anxiety 1 and Aggression 1 on adolescent adjustment factors to zero, instead modeling these influences to be indirectly mediated through relations of age five adjustment with adolescent adjustment. Although our previous analysis found no need for these effects in the presence of the direct effects with childhood emotional behaviors, these relations might have in part been partialled away by modeling the direct effects of childhood emotional behaviors. This model did not fit the data, as indicated by the significant loss of fit relative to the measurement model (see Table 3; χ^2 = 67.53, df = 31, p < .001).

Our second falsification model forced the emotional behavior/adolescent adjustment relationships to be mediated through emotional behaviors in the 7-12 age range. This model enabled us to ascertain whether the relationship of early emotional behaviors to adolescent adjustment could just as easily have been modeled as being mediated by the more contemporaneous emotional behaviors in the 7-12 age range. As shown in Table 3, this alternative model also did not adequately fit the latent covariances, as judged by significantly poorer fit than the final measurement model. We may therefore conclude that these data do indeed seem to require direct effects of childhood emotional behaviors on adolescent adjustment.

Discussion

The purpose of this study was to evaluate the relationships between negative emotional behaviors such as aggression and multiple aspects of psychological adjustment during development from childhood through adolescence. An intriguing set of findings have emerged from our analysis. First, we found that two separate dimensions of negative emotional behaviors may be identified--aggression and anxiety--and that these dimensions are observed both in early childhood (years 1-6) and the preadolescent years (years 7-12). As we have noted above, we have used the terms aggression and anxiety to label factors representing several behaviors. The anxiety dimension for the years 1-6 is composed of anxiety, dissatisfaction, peer difficulties, all during years 1-6, with the additional components of eating problems and fears at age 3. The aggression dimension for the years 1-6 is comprised of aggression and noncompliance during years 1-6. The anxiety dimension for years 7-12 is comprised of anxiety and depression during years 7-12, and the aggression dimension for the years 7-12 is comprised of aggression, disobedience, and school difficulties, all during years 7-12. These dimensions are positively correlated--aggressive children are also likely to be anxious--but the correlation is sufficiently small (and sufficiently similar across the two age intervals) to argue for two separable dimensions of negative emotional behaviors. Given that slightly different indicators of negative emotional behaviors were used in each of the two age intervals, we cannot fully address the question of whether

there are subtle shifts in the interrelationships among emotional behaviors that comprise the manifest attributes marking the two dimensions. Nevertheless, the two dimensions appear subjectively to be quite similar, in terms of magnitudes of factor loadings.

If we assume that isomorphic dimensions of negative emotional behaviors have been identified here, then perhaps the more interesting question becomes: how stable are individual differences in these emotional behaviors through child development? Are aggressive children in early childhood likely to remain so as they mature? In large part, the answer to this question is yes. There seems to be a substantial amount of stability in individual differences on the two dimensions between the two age intervals. Aggression is the more stable of the two dimensions, with a standardized autoregressive coefficient of .84. Anxiety had a simple autocorrelation of .70 which, when decomposed by path analysis, represented a direct autoregression from Anxiety and a lagged effect of Aggression on Anxiety. In both cases, however, more than 50% of the variance in negative emotional behaviors was consistent across the age interval. Certainly, stability coefficients in this range indicate at least a moderate level of consistency in individual differences; highly aggressive children are much more likely to remain relatively more aggressive over time, but the instability is sufficiently large to allow for multidirectional individual developmental patterns (e.g., McCall, 1979).

In contrast to the negative emotional behaviors, adjustment shows little continuity across the three age points covered. To be sure, this difference is probably determined to some degree by the different time points at which the adjustment ratings were made (ages 3, 5, and in adolescence). We note, however, that there seemed to be a noticeable emergent trend in the factor structure of adjustment variables across the three points in time. At age 3, a single adjustment factor was identified, associated primarily with adjustment to parents and parental discipline. At age five, a second factor emerged, associated primarily with motor problems, and the loadings of the more general adjustment factor at age 5 were somewhat different than at age 3. In particular, fears clearly loaded on the adjustment factor at age 5, but not at age 3. In adolescence, three separate adjustment factors were identified: family-related adjustment, goal/school-related adjustment, and peer-related adjustment.

There also appeared to be relatively little stability in adjustment, in that there seemed to be little predictive value of early adjustment problems (ages 3 and 5) for the three adolescent adjustment factors. This contrast in stability between negative emotional behaviors and adjustment is undoubtedly influenced by the age-specificity of the measures of adjustment employed. If we interpret the emergent factor structure of adjustment as indicating discontinuity in manifestation of adjustment, then it makes little sense to expect high levels of stability on these dimensions. If one could observe the developmental point of emergence for the

three separate adjustment factors identified in adolescence then one could separate instability in this period from discontinuity. Obviously we are not in a position to do so with these data.

The most interesting set of results from this study involved the path model predicting adolescent adjustment from negative emotional behaviors and prior adjustment. We found that early negative emotional behaviors (years 1-6) were the best predictors of adolescent adjustment problems with family and peers. This pattern was specific to the type of emotional difficulty; aggression predicted poor adjustment in the family, whereas anxiety predicted adjustment problems with peers. Adjustment at age 5 added no additional predictive value, nor did subsequent emotional problems in the 7-12 age range. We did find that goal/school adjustment problems were best predicted by aggressive behaviors in the 7-12 age period. Certainly the pattern of emotion/adjustment relationships is consistent with intuition and the extant literature--aggressive adolescents have problems adjusting to parents, and anxious, shy, or otherwise introverted adolescents often have difficulty with friendships and peer relations (Asher et al., 1976; Foster & Ritchey, 1979; Gottman et al., 1975; Robbins, 1972). We note also that, in the early years, aggression was a predictor of adjustment difficulties in the home. What is surprising about these results is 1) the long-term prediction of adolescent adjustment by emotional behavior problems in <u>early</u> childhood, and 2) the lack of additional prediction of adolescent adjustment by later childhood adjustment. It may be that the emotional behavior

problems such as anxiety and aggression represent a more serious dysfunction than the individual adjustment problems such as fears, eating problems, motor problems, etc. Indeed, the stability of the negative emotional behaviors implies that children who manifest them early in their lives tend to manifest them later on as well, again indicating a more serious dysfunction than adjustment problems per se. The lack of additional prediction of adolescent adjustment by child adjustment again may imply a more transient nature of these problems, such that a child manifesting a set of adjustment-related problems which are age-specific does not necessarily manifest age-specific adjustment problems later on.

The early prediction of family and peer adjustment problems is intriguing, although it should not be overinterpreted. In particular, since aggression and anxiety are relatively stable over the 1-12 year range, the prediction of adolescent adjustment by negative emotional behaviors in early childhood implies prediction of adjustment problems by emotional behaviors in the 7-12 age range. An aggressive child in the 7-12 age range is also more likely to have adjustment problems in the home. However, the alternative models tested by us show that the relationship is indeed stronger for early childhood emotional problems and that later emotional problems do not provide incremental prediction of adolescent adjustment above and beyond that provided by early emotional problems. What are we to make of this finding? One possibility is that the emergence of negative emotional behaviors early in childhood is evidence of a pattern of emotional dysfunction that carries

over into adolescence and influences adjustment problems at that point in the developmental cycle. Future research should use short-term longitudinal designs to look at the transition from childhood to adolescence as in the present study, and, in addition, the transition from adolescence to adulthood, to determine if similar patterns emerge.

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Figure Captions

Figure 1: Alternative models for behavior-adjustment relations.

Figure 2: Estimated model for behavior-adjustment relations.

Footnote

[1]For ease of LISREL specification these relationships were modeled in Λ and are shown as standardized factor loadings for ANX1 or MOT2 in Table 1.

[2]A listing of the unstandardized LISREL estimates and their standard errors is available from the authors upon request.

Table 1

Standardized Factor Loadings

	ANX 1	AGG 1	ANX 2	AGG 2	PAR 1	PAR 2	MOT 2	GOAL	SOC	FAM
Anxiety 1-6	0.715	0	0	0	0	0	0	0	0	0
Aggression 1-6	0	0.664	0	0	0	0	0	0	0	0
Dissatisfaction 1-6	0.523	0	0	0	0	0	0	0	0	0
Noncompliance 1-6	0	0.639	0	0	0	0	0	0	0	0
Peer Difficulties 1-6	0.754	0	0	0	0	0	0	0	0	0
Anxiety 7-12	0	0	0.741	0	0	0	0	0	0	0
Aggression 7-12	0	0	0	0.727	0	0	0	0	0	0
Depression 7-12	0	0	0.819	0	0	0	0	0	0	0
Disobedience 7-12	0	0	0	0.792	0	0	0	0	0	0
School Difficulties 7-12	0	0	0	0.544	0	0	0.301	0	0	0
Eating 3	0.384	0	0	0	0.458	0	0	0	0	0
Fears 3	0.388	0	0	0	0	0	0	0	0	0
Relationship with Parents 3	0	0	0	0	0.548	0	0	0	0	0
Discipline 3	0	0	0	0	0.739	0	0	0	0	0
Parental Attitudes 3	0	0	0	0	0.575	0	0	0	0	0
Fears 5	0	0	0	0	0	0.407	0.284	0	0	0
Speech 5	0	0	0	0	0	0	0.433	0	0	0
Motor 5	0	0	0	0	0	0	1.0	0	0	0
Parental Attitudes 5	0	0	0	0	0	0.830	0	0	0	0
Discipline 5	0	0	0	0	0	0.648	0	0	0	0
Relationship with Siblings 5	0	0	0	0	0	0	0.365	0	0	0
Parental Attitudes 5	0	0	0	0	0	0.466	0	0	0	0
Self-Evaluation A	0	0	0	0	0	0	0	0.450	0.590	0
Family Relationships A	0	0	0	0	0	0	0	0	0	0.697
School Functioning A	0	0	0	0	0	0	0	0.686	0	0.293
Social Functioning A	0	0	0	0	0	0	0	0	0.949	0
Goals A	0	0	0	0	0	0	0	0.718	0	0
Goal Implementation A	0	0	0	0	0	0	0	0.796	0.300	0
Coping A	0	0	0	0	0	0	0	0.449	0	0.666
Person Orientation A	0	0	0	0	0	0	0	0	0.863	0
Task Orientation A	0	0	0	0	0	0	0	0.943	0	
Communication A	0	0	0	0	0	0	0	0.311	0.173	0.375
Emotional Expressiveness A	0	0	0	0	0	0	0	0.247	0.426	0

Note. 1-6 = measured for years 1-6; 7-12 = measured for years 7-12; 3 = measured at age 3; 5 = measured at age 5; A = measured in adolescence.

Table 2

Factor Correlation Matrix

	ANX1	AGG1	ANX2	AGG2	PAR1	PAR2	MOT2	GOAL	SOC	FAM
ANX1	1.000									
AGG1	0.640	1.000								
ANX2	0.721	0.714	1.000							
AGG2	0.563	0.808	0.562	1.000						
PAR1	0.293	0.492	0.322	0.234	1.000					
PAR2	0.488	0.457	0.272	0.238	0.464	1.000				
MOT2	0.190	0.390	0.087	0.253	0.229	0.009	1.000			
GOAL	-0.142	-0.366	-0.231	-0.423	-0.345	-0.234	-0.216	1.000		
SOC	-0.554	-0.507	-0.375	-0.249	-0.006	-0.263	-0.195	0.150	1.000	
FAM	-0.478	-0.688	-0.483	-0.578	-0.198	-0.286	-0.329	0.504	0.780	1.000

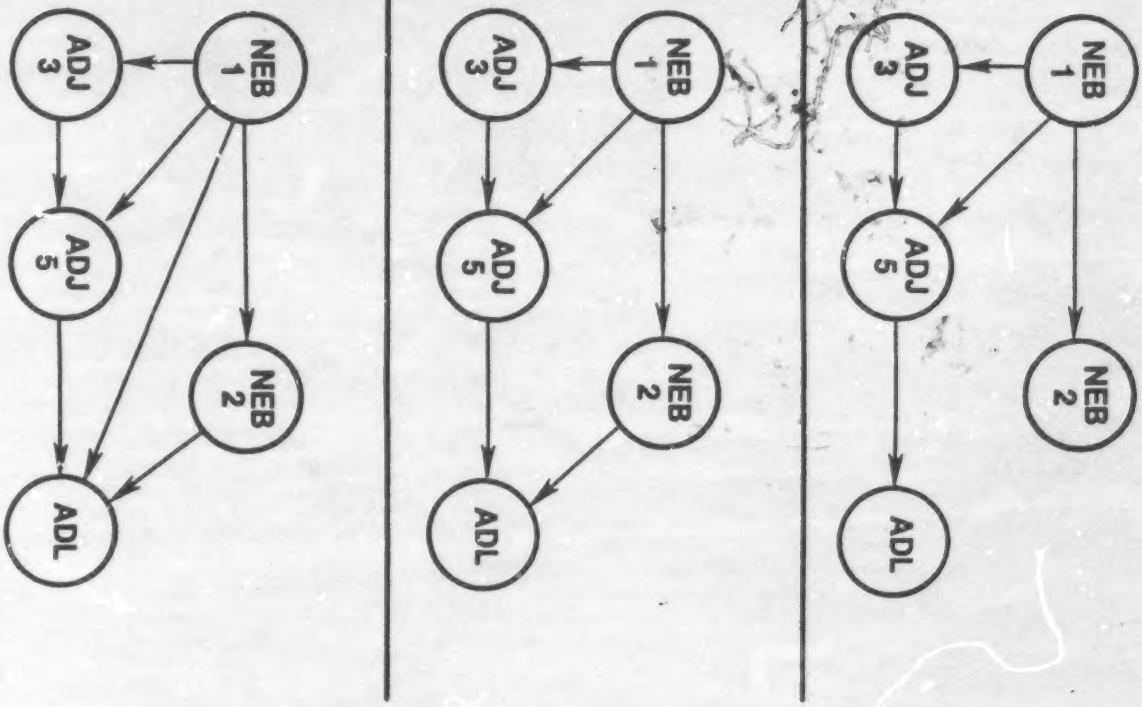
Table 3

X^2 Tests for Structural Regression Models

Model	Description	X^2	df	GFI[a]	ΔX^2[b]	df	p
I	Measurement model	581.49	434	.72	-	-	-
II	Model with direct effects of 5-year adjustment on adolescent adjustment	608.56	463	.71	27.07	29	NS
II	No direct effects of 5-year adjustment	609.45	466	.71	0.89	3	NS
III	Delete path (Final model)	609.88	467	.71	0.43	1	NS
					FROM MEASUREMENT MODEL		
IV	1st Falsification model (mediation)	649.02	465	.70	67.53	31	< .001
V	2nd Falsification model (effects through NEBS2)	625.97	465	.70	44.48	31	< .05

[a]GFI-LISREL goodness of fit index.

[b]ΔX^2-change in X^2.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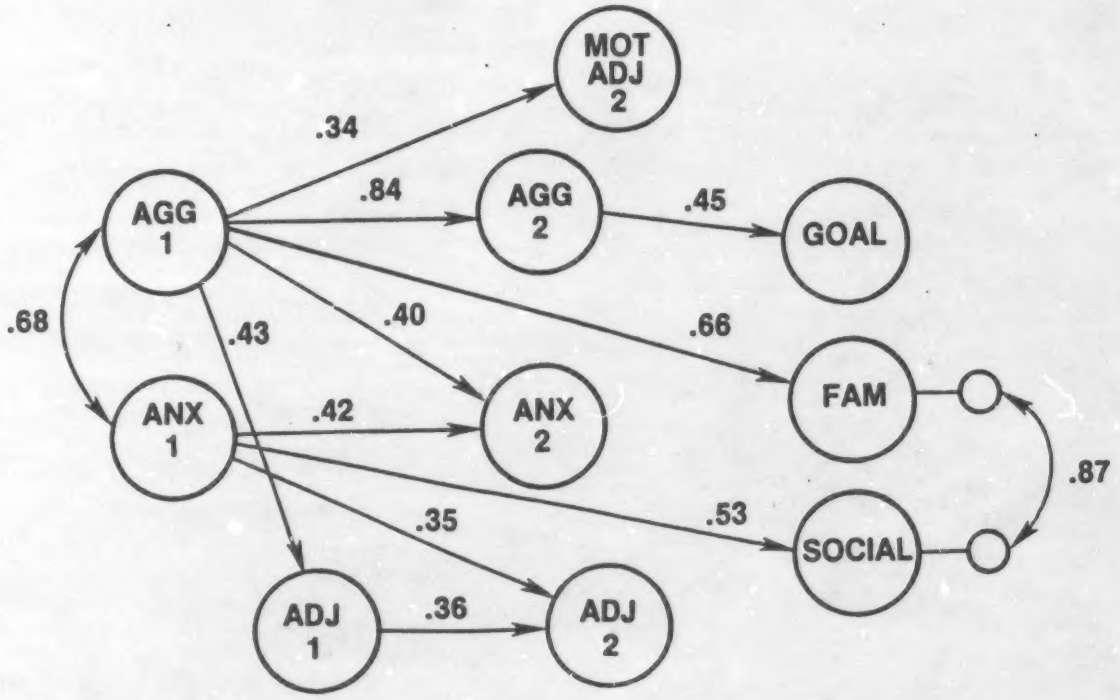
MOT ADJ 2
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AGG 1
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GOAL
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FAM
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SOCIAL
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ADJ 2